L15: Entry 9 of 22 File: USPT Mar 12, 1996

DOCUMENT-IDENTIFIER: US 5498216 A
TITLE: Drive arrangement for an electric motor vehicle and process for shifting gears

Brief Summary Text (15):
Based on known automatic transmissions in vehicles with a combustion engine, further developments of the invention can also provide for a manual gear selection lever in order to select a desired gear. A signal indicative of the manually selected gear is conveyed to the control system. For this, an input to the control system is all that is necessary, and no other intervention is required. Synchronization of the coupling halves for the preselected gear will then be established with the same precision as in the-case of an automatically selected gear.

Brief Summary Text (26):
According to another characteristic of the inventive process, the desired gear is automatically and repeatedly determined from the current driving data: input transmission RPM's, output transmission RPM's and input transmission torque or engine torque. Thus an updated value is always available and the control system reacts promptly to a change in driving conditions. If a desired gear is pre-selected with a selector lever, the control system reacts promptly thereto. The position of the selection lever can be ascertained and incorporated in the process in only a single computer step.

Detailed Description Text (4):
This embodiment of the gear box 5 is a two-gear transmission. In a different embodiment, it could also have three gears. The first shaft 6 is provided with two fixed gears 25, 26 which mesh with two free gears 23, 24 on the second shaft 7. A coupling sleeve 27 or a coupling element (depending on the type of coupling) is non-rotatably connected to the second shaft 7 and can be coupled from a neutral position "0" selectively to one of the free gears 23, 24, depending on which of the two gear positions "I" or "II" is to be selected. A first coupling 29 comprises the coupling sleeve 27 and the corresponding teeth or dogs of the free gear 23, and a second coupling 30 comprises the coupling sleeve 27 and the teeth or dogs of the free gear 24. The shifting movement is carried out via a fork 28 which extends from the actuator 14 into the interior of gear box 5. It is an essential feature of the invention that the gear box 5 is not mechanically synchronized, and for this reason simple dog or tooth clutches 29,30 suffice. The synchronization is ensured by the control system 12. The control system 12 receives a gas pedal position signal 15, a braking signal 16, and a gear selection signal 17. To accommodate drivers used to combustion engines, the brake pedal is designed so that the braking signal 16 first causes a braking of the motor and acts in addition on the wheel brakes only if the applied pedal force exceeds a predetermined value. The control unit 12 comprises a microprocessor which is loaded with a program consisting of a routine and subroutines to generate output signals 19 and 22 on the basis of the input signals 10,11,15,16,17 and 18. The output signal 19 acts upon the control rectifier 20 to control the output of the electric motor 3, while the output signal 22 acts upon the actuator 14 of the gear box 5.

Detailed Description Text (7):
FIG. 4 shows the routine "check gear". To determine the current gear (field 30) the sensor 13 (FIG. 2) is polled on the position of the actuator 14 (FIG. 2). The RPM ratio is then derived from the signals of the RPM sensors 8,9 (field 31) and is compared over a certain period of time with the position of the actuator as per field 32. If the two do not match, an error flag is set (field 33). If they do match, the system asks in field 34 whether the automatic mode has been selected. If it was selected, the desired gear is determined in field 35 automatically on the basis of the current travel data: transmission input RPM, transmission output RPM and input torque. The transmission input and output RPM's are obtained first from the signals of the RPM sensors 8,9, and the signal for input torque is taken from the control rectifier 20. If the automatic mode is not selected, signal 17 from the manual selection lever (not shown) is read into field 36. If no

manual selection lever is provided the fields 34 and 36 can be omitted.

Detailed Description Text (9):
The sub-routine "determine desired gear automatically from travel data" in FIG. 5 is started from field 35 in FIG. 4. The current gear is ascertained in fields 42 and 43. If it is the 1st gear (field 42) or the 2nd gear (field 43), the RPM ratio is first checked in the field 44 or 49, and the limit speed for the current gear is then determined in the fields 45 or 50. The limit speed in 1st gear is a given constant N.sub.-- 12 (in the second gear it is N.sub.-- 21), plus the ratio between the current torque to maximum torque, multiplied by a hysteresis factor N.sub.-- 12delta (N.sub.-- 21delta in the 2nd gear). If the current speed is higher in 1st gear, or lower in 2nd gear than the limit speed (field 46 or 51), the other gear is declared to be the desired gear in the field 47 or 52. In case of a three-gear transmission, two limit speeds must be provided for the middle gear. If an error is found in the field 44 or 49 during the verification of the rotational speed ratio, the current gear is defined as the desired gear in the field 48 or 53. If it is found in the field 42 or 43 that neither of the two gears is selected, that is to say that the actuator is in neutral position, either the 1st gear (field 54) or the 2nd gear (field 53) becomes the desired gear upon comparison between the transmission output speed (or the wheel speed) and a limit value in field 41. Upon completion of this sub-routine the system returns via "return" into field 35 of FIG. 4.

CLAIMS:

2. The drive arrangement of claim 1 further comprising a manual gear selection lever which produces a signal indicative of a manually selected gear, said control unit receiving said signal indicative of said manually selected gear and causing said actuator to engage said manually selected gear.

4. A process for shifting gears in a drive arrangement for an electric motor vehicle, said drive arrangement comprising an electric motor the output of which is controlled by a control rectifier, a gear box having at least first and second gears, first and second couplings associated with said first and second gears, and a movable actuator which causes said first and second couplings to engage said first and second gears, said process comprising

(a) verifying whether an actually engaged gear is a desired gear, wherein said desired gear is calculated automatically from signals indicative of the rotational speed at an output side of said gear box, and the torque produced by said electric motor,

(b) if not, issuing a shift command signal which lowers the torque being produced by said electric motor to zero along a defined lowering torque path,

(c) bringing said actuator into a neutral position,

(d) by means of said control rectifier, changing the output of said electric motor until it is rotating at a target rotational speed,

(e) by means of said actuator and one of said couplings, causing said desired gear to become engaged when said electric motor reaches said target rotational speed, and

(f) increasing the torque produced by said electric motor to a desired torque along a defined increasing torque path.

5. The process of claim 4 wherein said drive arrangement further comprises a manual gear selection device, said process further comprising determining if a gear has been manually selected, and setting said desired gear to said manually selected gear.

Previous Doc Next Doc Go to Doc#

Refine Search

Search Results -

Terms	Documents
L13 and L14	22

Database:
US Pre-Grant Publication Full-Text Database
US Patents Full-Text Database
US OCR Full-Text Database
EPO Abstracts Database
JPO Abstracts Database
Derwent World Patents Index
IBM Technical Disclosure Bulletins

Search: L15

Refine Search

Recall Text | Clear | Interrupt

Search History

DATE: Saturday, October 29, 2005 Printable Copy Create Case

Set Name side by side	Query	Hit Count	Set Name result set
DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=OR			
L15	l13 and L14	22	L15
L14	select$	4122698	L14
L13	l11 same L12	40	L13
L12	gear$box or (gear adj box)	89448	L12
L11	whether near3 engag$	3737	L11
L10	l8 and L9	0	L10
L9	gear$box adj engag$	116	L9
L8	"which"	147	L8
L7	"which" adj3 gear$box	0	L7
L6	"which" adj3 gear$box adj engag$	0	L6
L5	l2 and L4	2	L5
L4	gearbox near3 engag$	810	L4
L3	l1 and L2	1	L3
L2	calculat$ near (gear adj ratio)	649	L2
L1	gearbox adj engag$	116	L1

END OF SEARCH HISTORY